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SCIENCE NEWS LETTER

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THE WEEKLY SUMMARY OF CURRENT SCIENCE



President A.A.S.

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DO YOU KNOW?

Half of the victims of firearms in hunting accidents are youths in their teens.

The government of Peru has had sodium lights installed along the highway connecting the cities of Lima and Callao.

A number of American milk cows may be sold in Venezuela due to the program inaugurated by the Government there for elimination of tuberculous milk cattle.

Potatoes if stored with certain fruits such as apples or pears do not sprout so quickly; but the fruit may lose some of its flavor by association with the potatoes.

A Yellowstone Park ranger has seen bears swallow pine needles before hibernating, presumably so that the mass of needles may keep off hunger pangs in an empty stomach.

After burying 6,500 non-ferrous pipe materials in the ground to test the effect of soils on various kinds of pipe line, a government scientist reported that no one material seemed superior to all others.

Tribes in Madagascar weave cloth from silk of wild silkworms.

Dental plates were first patented in the United States on August 28, 1840.

There was no symbol in the arithmetical scheme of the ancient Greeks to denote zero.

A naturalist reports that he can collect a variety of insects from the stomachs of trout.

Two stainless steel streamlined buses, completely air-conditioned, are being built for service on the Syrian Desert.

Experiments by government scientists show that the gizzard of a chicken is a food grinder but not a digesting organ.

To reforest denuded areas in Yellowstone Park, more than a half-million seedlings are being grown in a nursery in the park for transplantation.

A new government process for drying egg white more quickly and effectively is expected to prove useful to bakers, candy makers, and other food industries which use 1,500,000 pounds of dried egg white a year.

WITH THE SCIENCES THIS WEEK

Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the article.

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What plans are being made to study Americans' attitudes toward fascism and communism? p. 26.

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RADIO

How long are the shortest continuous radio waves ever produced? p. 24.

ZOOLOGY

On what does a baby whale feed? p. 25.

BIOLOGY-MEDICINE-CHEMISTRY

Border Between the Living And Non-Living Is Now Erased

Prize-Winning Research Demonstrates That Inanimate Chemical Molecules Can Cause Disease and Act Alive

ERASING the border line between the living and the non-living, and listing inanimate chemical molecules of protein as infectious disease-producing agents along with living organisms, such as bacteria, fungi, and protozoa, the researches of Dr. W. M. Stanley of the Rockefeller Institute for Medical Research, reported to the American Association for the Advancement of Science here, promise to open a new chapter not alone in medicine but in biology.

It is new knowledge which the future may well prove as important as some of the pioneer work of Pasteur, Koch and other science immortals, and is given deserved recognition in the award of the thousand-dollar prize of the American Association for the Advancement of Science for an outstanding paper presented before the Atlantic City meeting. Dr. Stanley's research has far-reaching possibilities and breaks down the already battered walls between physics, biology, medicine and chemistry.

"What I like about my research," said Dr. Stanley in commenting on his paper, "is that it is neither physics, nor medicine, nor biology, but on the borderline of all these."

Incidentally, Dr. Stanley was made very uncomfortable during the week of the meeting by what is probably an invasion of protein molecules. For he had a severe cold. Colds are just one of the many diseases that are caused by viruses, which Dr. Stanley's work on plant ills shows are caused by protein molecules that infect their victims much as though they were living germs.

Dr. Stanley's work demonstrates that what have been called virus diseases are due to infection with just a few molecules of protein. Within the susceptible victim these bits of chemicals multiply enormously as though they were living germs—or rather they force their unwilling host to produce not normal protein but more of the disease-producing sort.

So far Dr. Stanley and his associates have worked only with the virus diseases in plants—tobacco, tomato, spinach and phlox plants with mosaic dis-

eases—but these are considered quite typical. There is every expectation that when some of the virus diseases that cause human ills are studied they will be found to be of the same nature.

This means that medical science is about to pick up a "hot scent" in its pursuit and attempt at conquest of such devastating ills as infantile paralysis, encephalitis, measles, and perhaps even influenza, common colds, and cancer. And we may discover the unknown cause of smallpox, which nevertheless can be completely controlled by vaccination. All those are considered to be caused by invisible infectious agents called viruses. Hardly less important and damaging are the virus diseases in animals and plants.

The protein non-living "germ" isolated by Dr. Stanley and identified as tobacco mosaic virus is a giant among molecules, weighing seventeen million times the basic hydrogen atom and having a diameter of about thirty-five millimicrons. This means it is almost but not quite large enough to be seen by means of visible light, but is small enough to slide through fine filters used by chemists. Its relatively large size allows it to be concentrated by whirling around in high-speed centrifuges.

Not just one kind of virus protein exists, but many. Dr. Stanley has found different kinds of mosaic plant diseases are caused by different high weight protein molecules. In fact, one kind of disease-causing protein will turn into another. Here is the strange fact that a non-living chemical will, to use a biologist's term, "mutate."

In this there may have been discovered the very mechanism of evolution itself—accidental changes in the chemical molecule being reproduced and perpetuated, giving rise to a new kind of stuff. This repeated many times would make new plants and animals out of old.

In another sense Dr. Stanley suggests that the virus protein molecule is a missing link between chemistry and biology. By virtue of its large size the protein molecule seems to possess sufficient or-



ATOMIC SKYWRITING

Atom pathways inside an ultra high frequency radio tube are made visible in special demonstration apparatus exhibited by the RCA Corporation at the meeting of the A.A.A.S. Pictures were obtained with a special magnetron type radio oscillator tube now being developed for generating radio waves only a meter and a half long. The tube operates in a strong magnetic field so that when electrons come off from the cathode, they spiral several times before reaching their destination at the tube's plate. In the special tube this plate is coated with willemite and a small amount of argon gas was introduced so that impacts of the electrons would create the visible path.

ganization within its chemical self to reproduce and change—properties regarded as characteristic of living things. Dr. Stanley suggests that it is a bridge between chemical organization within the atom and molecule and biological organization within the living cell.

It is quite possible that science now has its finger upon the essence of life itself or at least the mechanism by which one generation hands it on to the next. The protein molecules have many characteristics of the "gene," the unit of heredity within the germ cell's chromosomes. For instance, that matter of being able to mutate. And the size is about that visualized for the gene. If Dr. Stanley's virus protein turned out to be the gene or even cousin to the gene, this discovery will transcend its possible use in disease treatment.

And this use of virus protein may be just around the corner, for Dr. Stanley finds a virus may be inactivated or made non-disease producing and yet retain its property of giving immunity to disease.

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BIOLOGY-MEDICINE-CHEMISTRY

Dr. Stanley's Prize Research Described in His Own Words

By DR. W. M. STANLEY, Rockefeller Institute for Medical Research, Princeton, N. J.

SOME of the most devastating diseases affecting man, animals, and plants are caused by invisible infectious agents called viruses. In the past viruses have been generally characterized by their invisibility, by their ability to pass filters capable of holding back ordinary bacteria, and by their inability to multiply in the absence of living cells. However, even these general characteristics have not been completely acceptable, for there have been reports that some viruses have been seen, others held back by filters, and still others cultivated on lifeless media. The confused state of our knowledge concerning even simple basic properties of viruses has led to an even greater confusion regarding the nature of these agents. They have been regarded variously as protozoa, as invisible forms of ordinary bacteria, as a new kind of invisible living organism, as unusual products of cellular metabolism, as enzymes, and as different kinds of inanimate chemical substances. Because of the general confusion regarding the very nature of these agents, because of the increasing importance of certain virus diseases, and because of improvements in the technique of handling and titrating certain viruses, the time seemed propitious for a concentrated, definitive attack on the nature of viruses. It seemed obvious that this attack should be centered on tobacco-mosaic virus, the first virus to be discovered, because of its high infectivity, its stability, and its availability.

Accordingly, four years ago a study of tobacco-mosaic virus was started in this laboratory. Since knowledge concerning this plant virus was as confused and contradictory as that concerning viruses in general, it was deemed advisable to confine the preliminary work to a study of the basic properties of this virus. Perhaps the most important finding resulting from this preliminary work was the indication that this virus was protein in nature. This information plus improved methods for working with proteins, recently made available through studies on crystalline enzyme proteins, soon led to the isolation from

mosaic-diseased plants of a crystalline protein possessing the properties of the virus.

This protein proved to be quite unusual, for it was found to have a molecular weight of about 17,000,000, a value considerably larger than that of any other known protein. This high molecular weight has made it possible to centrifuge the molecules from solution and to crystallize the protein by means of an ultracentrifuge. Chemical studies on this unusual crystalline protein indicate that it is tobacco-mosaic virus. The virus activity, chemical composition, and optical rotation of protein obtained from many different batches of starting material are the same. These properties remain constant during ten recrystallizations of the protein, or when the protein is fractionally crystallized, or fractionated by means of adsorption on and elution from celite. Denaturation or hydrolysis of the protein by enzymes, by acids, by alkalis, or by heat is accompanied by loss of virus activity. It has been impossible to separate the activity from the protein by filtration through collodion membranes, by centrifugation of protein at the isoelectric point, by centrifugation of negatively or positively charged protein from solution, or by centrifugation of the protein from solutions containing other proteins such as tobacco plant proteins, egg albumin, trypsin, or pepsin. The results indicate that the protein and the virus are identical. The fact that the absorption spectrum of the protein agrees essentially with the destruction spectrum of the virus activity is a further indication that they are identical. Chemical analyses, ultracentrifugal analyses, and absorption spectrum measurements have demonstrated that this high molecular weight protein does not exist in normal plants and that it is characteristic of mosaic-diseased plants. Furthermore, the same or a closely related active, high molecular weight, crystallizable protein has been isolated from mosaic-diseased tomato, spinach, and phlox plants. The isolation of the protein from the two latter plants is of especial interest and significance, since there is no serological relationship between the protein from normal tobacco plants and that from normal spinach or phlox plants. Two

additional crystalline proteins have been isolated from extracts of Turkish tobacco plants infected with a masked and a yellow strain of tobacco-mosaic virus, respectively. These two proteins are related to each other and to ordinary tobacco-mosaic virus protein, yet they possess chemical and physical properties that distinguish them from each other and from the latter protein. Thus, when tobacco-mosaic virus becomes changed or mutates, it gives rise to a new protein. There is, therefore, abundant evidence indicating that the virus activity is a specific property of these unusual high molecular weight proteins. It seems reasonable to conclude, for the present at least, that the unusual high molecular weight protein isolated from mosaic-diseased plants is actually tobacco-mosaic virus.

Since this is a typical virus, it seems likely that other viruses will be found to be similar entities. Thus, considerable information is now available concerning the nature and mode of action of certain viruses. Infection may be regarded as the introduction of a few molecules of a virus protein into a susceptible host. These few molecules have the ability to direct the metabolism of the host so that it produces not normal protein but more of the virus protein. Disease may be regarded as the disruption of normal metabolism caused by the production of virus protein. Occasionally during the production of virus protein by the host new strains arise, possibly through the chance production of one or more molecules of a slightly different protein. The mutation of tobacco-mosaic virus and the rate of inactivation by X-rays indicate that certain of its properties are similar to those which have been regarded as characteristic of genes.

It is obvious that the protein possesses certain properties which have been regarded as characteristic of living things, yet it itself is non-living. This fact may be of fundamental importance in biology. From the standpoint of chemistry, the net result of virus activity may be regarded as that of an autocatalytic reaction, yet the protein is not a simple autocatalyst. It may be regarded as a super-catalyst, possessing not only catalytic properties, but properties characteristic of genes and other properties similar to those of mammalian organizers. In view of the properties which the crystalline tobacco-mosaic virus protein possesses, the borderline between the living and non-living tends to become non-existent.

Since at least certain virus diseases are

really protein diseases, the pathological aspects of virus disease acquire a new significance. Certain basic facts concerning one virus disease may prove to be useful in the study of other virus diseases. For example, in the case of most virus diseases it has been difficult to induce immunity without the use of active virus. Inactive virus has given poor results, yet in most cases it is dangerous to use active virus. In the case of crystalline tobacco-mosaic virus, methods have been evolved for inactivating the virus so that the inactive virus gives practically the same immunological response as that given by active virus. These methods involve careful treatment of the active protein so that the groups responsible for the virus activity are blocked or removed without disrupting the molecule as a whole. It is possible that this and similar studies on crystalline tobacco-mosaic virus may prove useful in the study of other viruses. Whether this unusual, high molecular weight, crystalline protein is regarded as living, as non-living, as a gene, as a super-catalyst, as an organizer, or as a pathological protein, a complete study of its basic properties should prove of importance. It is now possible to list protein molecules, along with living organisms such as bacteria, fungi, and protozoa, as infectious disease-producing agents.

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MATHEMATICS

Harvard Mathematician Made President of A. A. A. S.

Dean of Graduate School of Arts and Sciences,
Author of Mathematical Theory of Beauty Is Honored

OFFHAND you might not expect a great mathematician to be interested in why it is that men throughout countless ages have taken joy in looking on the moon, a shapely tree, a pearl or the rhythmical curves of a woman's form.

Yet Dr. George D. Birkhoff, Harvard mathematician, who was elected president of the American Association for the Advancement of Science for the coming year, has made the mathematical measure of art one of his main branches of research.

He has devised formulae that enable you to analyze the source of delight in the creations of painters and poets. The esthetic value of a shape or form as determined by the Birkhoff formula conforms to the emotional judgment of those who look upon it. Not that you need to be a mathematician to delight in art. Esthetic pleasure is due to an unconscious appreciation of the mathematical proportions of the object.

In a detailed treatment of esthetic measure which he published not long ago, Dr. Birkhoff has told how painters, architects and others can use consciously some rules that he has discovered. Take forms made with straight lines. The square is rated as the straight line form having the highest esthetic appeal, being rated as 1.50 compared with the diamond at 1.00 and the triangle at 0.63. Take a famous painting. Dr. Birkhoff finds that its composition involves geometric forms which are pleasing to the eye.

The pretty girl is pretty because all her measurements are in correct relation to each other—if her arms were longer or her nose shorter or her height just a little different in relation to her weight, the effect would not be at all the same.

Dr. Birkhoff's formulae for esthetic values can also be applied to music and poetry. The scale used for poetry, for example, is not the same as the one applied to pictures, but it involves such artistic qualities as rhyme, rhythm and alliteration. Dr. Birkhoff has even tried building experimental poems and musical compositions by deliberately placing in them the elements indicated by the formula.

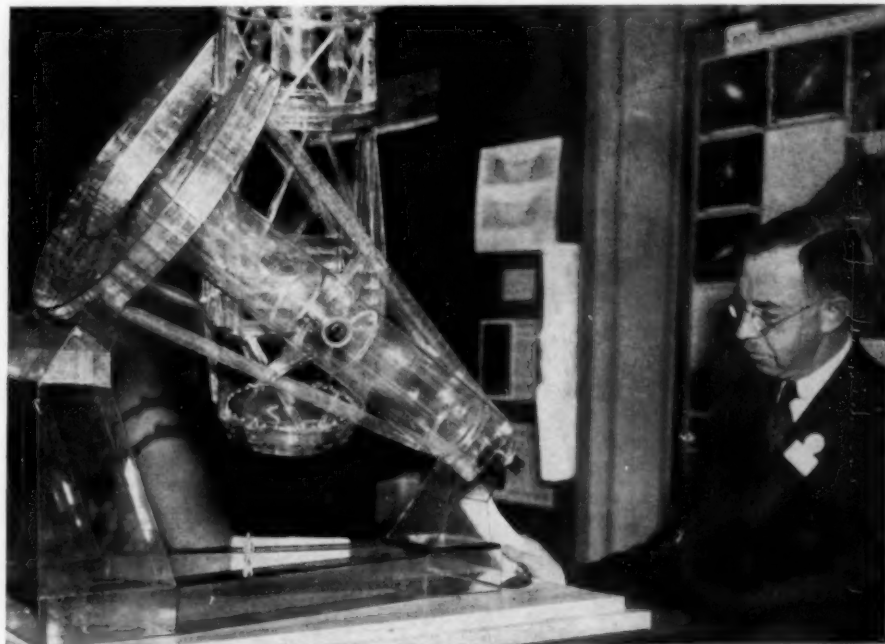
Just a short time ago Dr. Birkhoff, who is only 52, was made dean of Harvard's Graduate School of Arts and Sciences, where he has been professor of mathematics since 1919.

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PHYSICS

New Theory of Atom by New A.A.A.S. President

A NEW theory of atomic structure that may allow physicists to understand better the composition of matter was presented to the American Association for the Advancement of Science by Prof. George D. Birkhoff, of Harvard, one of America's leading mathematicians. It is called "a conceptual theory of atomic structure" and may recall to modern approval fundamental ideas that were first presented by the famous James Clerk Maxwell.



200-INCH TELESCOPE MODEL

Dr. Harlan T. Stetson, Massachusetts Institute of Technology, with a celluloid model of the great instrument on exhibit at the Atlantic City science meeting. Notice the scale figure of the man on base of instrument.

At the Philadelphia meeting of the Association in 1926 Prof. Birkhoff presented a paper showing how the fundamental wave equation, which had been discovered by Schrödinger within a few months, could be arrived at in an entirely different manner. This was done on the basis of a conceptual theory of matter and electricity. This paper won the \$1,000 prize for the 1926 meeting.

The principal characteristics of this theory were the following. A relativistic space-time was employed as the background for a certain "perfect fluid" which was the carrier of positive or negative electricity. In this fluid the disturbance velocity was that of light. The fluid was further endowed with a certain "atomic potential" which gave rise to a new term in the energy tensor of the fluid. In addition the positively and negatively charged portions of the fluid could freely interpenetrate. It was then shown that with suitable simple choices of the disposable quantities the same spectral frequencies would be obtained

for the hydrogen atom as arise from the Schrödinger wave equation when use is made of the Planck-Einstein law. However, in the further development of the theory considerable difficulties arose and it has only been recently that Prof. Birkhoff has studied the mechanism of radiation. Very significantly it has turned out that the arbitrary introduction of the Planck-Einstein law can be dispensed with.

Whether or not his modified theory proves to be ultimately serviceable to physicists as an actual atomic model, it presents suggestive points of interest which it is hoped will stimulate further studies of the same kind. Such studies ought to be made, Prof. Birkhoff said, since the possibility of conceptual relativistic models has not been thoroughly explored. If an acceptable model could be found which corresponded to reality, physicists would be forced to revert to the concept of the atom as bearing the stamp of the "manufactured article," in the sense of James Clerk Maxwell.

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BIOLOGY-ENTOMOLOGY

"Moon Element," Selenium, Cause of Blind Staggers

American Association Scientists Learn of Autogiro Attacks on Insects, of How Anesthetics Wear Off

THE MOON Goddess of ancient mythology was anything but mild and kindly. Woe to the youth who spied on Diana as she raced through the forest in her short-skirted sports costume! Speedy death was the best luck he could hope for. Later, as Luna, her silver arrows struck madness into the brains of men; whence our modern term "lunacy."

Now, in our own later times, a chemical element named after another of her names, Selene, has been convicted of causing damage and death, if not to man himself, then to the poor dumb beasts he values and tends. Selenium, in dry-land areas of the West, has been found responsible for the livestock diseases known since pioneer days as blind staggers, alkali sickness, and some forms of "loco."

At the meeting of the scientists' honor society, Sigma Xi, in connection with the Christmas week meetings of the American Association for the Advancement of Science, Dr. Henry G. Knight, chief of the bureau of chemistry and soils, U. S. Department of Agriculture, summed up the story of the solving of selenium's riddle.

Thanks to a concerted attack by many minds and from many angles, the once mysterious poisonings of livestock in parts of the Great Plains area were traced to their cause in a few years. The U. S. Department of Agriculture, the U. S. Public Health Service, and the state experiment stations of Wyoming and South Dakota were all represented on this particular battle-front of research.

Selenium is a compound chemically related to sulphur, but not nearly so abundant in nature. Purified, it has a white, moon-like luster, which suggested its scientific name. The mischief it causes comes not from pure selenium but from its salts or compounds in the soil.

Among the facts developed by the

cooperative research described by Dr. Knight are: selenium soils are found only where a particular type of shale rock has weathered out; it can cause trouble only in relatively dry regions, where rainfall is insufficient to wash the deadly stuff out of the soil; plants absorb it in varying amounts according to their own nature and also according to ecological conditions; animals eating the plants in which it is sufficiently concentrated sicken and may die.

To human beings the selenium soil situation is not directly dangerous, said Dr. Knight. If a man were living strictly under pioneer conditions on a piece of "seleniferous" land, eating nothing but what he raised on his own farm, he might get enough to make him sick. But even on the remotest prairies nowadays people bring their food from all the corners of the earth, so that a man can live all his life on selenium soil and never know it unless his livestock, which really do take all their living from the one piece of land, show selenium poisoning symptoms.

Autogiro Joins Insect War

A new combat machine has been recruited for the war against insects, that has not yet found its proper place in the military establishment. This is the autogiro, the "windmill" aircraft, that has something about itself suggesting an enormous flutter-winged insect in flight. S. F. Potts, Department of Agriculture insect fighter on the New England front with headquarters at New Haven, told something about it before the Association meeting.

The autogiro, said Mr. Potts, has certain advantages over the swifter airplane for the purposes of distributing insect poisons over woodland areas: it can fly at much lower speed, turn in smaller area, land and take off from smaller fields, and is safer to operate.

For use with aircraft, a concentrated spray mixture has been developed which Mr. Potts regards better than the poison dusts now widely employed. It drifts less, he said, it deposits itself more heavily on the foliage and sticks there better, and it can be released with satisfactory results in winds up to twelve miles an hour, as against the five-mile wind that is the limit of efficiency for airplane dusting.

Likes it Cold

A rare, exceedingly primitive insect that is happiest when it is near freezing, is ready to eat anything, and equally ready to fight anything, was de-

scribed by Dr. Harlow B. Mills and Prof. J. H. Pepper of Montana State College.

The creature is known in common parlance as "ice bug" or "alpine rock crawler" because of its preference for cold spots. Entomologists give it the rather formidable name of *Grylloblatta campodeiformis*, which translates roughly as "cricket-cockroach shaped like a caterpillar." Even to the experts it must look queer.

Dr. Mills and Prof. Pepper, who were fortunate enough last autumn to secure about 150 specimens in all stages of development, reported that the ice bug prefers a temperature of 38 degrees Fahrenheit, at which most other insects become dormant with cold, and that it suffered heat prostration at 80 degrees. Most common insects are normal at that temperature, and do not succumb to heat prostration until 120 degrees is reached.

The ice bug lives only at high elevations, from 5,400 to 8,600 feet. It is extremely solitary in its habits, and apparently of a mean disposition, although it can neither sting nor bite effectively. Scientists regard it as a "living fossil," for it is the sole survivor of a group that has been off the map for many millions of years.

Head-First Recovery

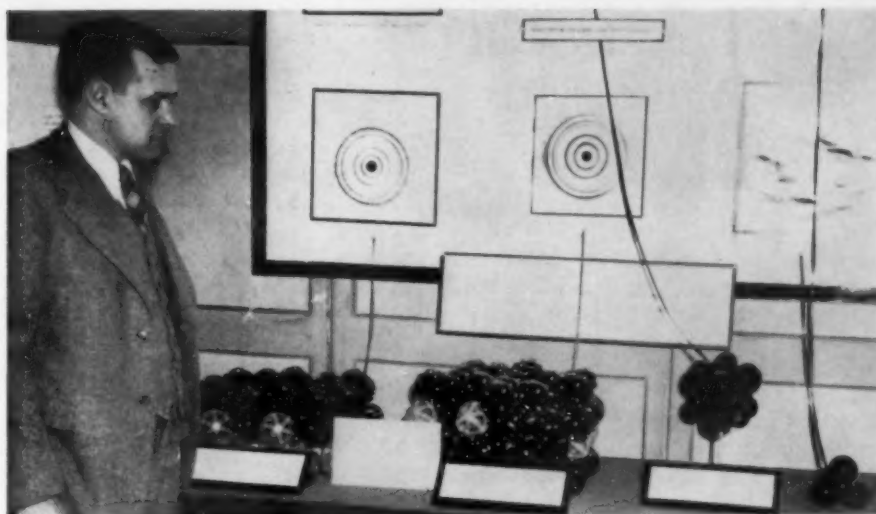
When the effects of ether anesthesia are wearing off, the recovery goes head-first. That is, the head and related parts are first to be able to feel and respond to stimuli again; then the forepart of the body and the front limbs; finally the wave of recovery sweeps all the way aft.

Albert C. Cornsweet, of the psychology faculty at the University of North Carolina, reported that he found this head-first, tail-last recovery to prevail in white rats which he had kept anesthetized for periods of from four to seven minutes.

An interesting feature of the experiments was that even though the animals showed evidence of recovery of feeling and response in this fore-to-aft fashion, they could not stand up and move about normally until their hind legs and tail regions were fully recovered.

Mr. Cornsweet is now investigating with other animals and other anesthetics, to find how widespread this phenomenon is in the animal world. He is also making tests on smaller body areas, to determine more narrowly the direction and rate of travel of the recovery wave.

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SOIL MOLECULE MODELS

Dr. Dean Burk, U. S. Bureau of Chemistry and Soils, with the Bureau's exhibit at the A.A.A.S. meeting. Bureau studies show that the colloidal content of all soils is of only two types. The models were made by Dr. Lewis Maxwell.

MEDICINE

Find a Possible Relation Between Glands and Cancer

GLAND activity may be a factor in the causation of at least some kinds of cancers, it appears from the report of Dr. J. Halsey Bagg of the Douglas Research Laboratory, Memorial Hospital and Cornell Medical College in New York City, to the American Association for the Advancement of Science.

Malignant tumors, or cancers, of the sex organs of fowl result, Dr. Bagg found, from chemical irritation with zinc chloride acting under the normal seasonal influence of the sex hormones which occurs during the early part of the year when the sex glands are most active.

At other times of the year, when the sex glands are inactive, the chemical irritation of zinc chloride failed to produce cancers. However, if the anterior pituitary hormone of sheep was used to stimulate the sex glands before injection of the irritating chemical, the cancers were produced even during the seasons when the sex glands were normally inactive.

Prolonged stimulation of the glands by pituitary hormone treatments alone without the chemical produced no tumors.

The tumors produced were malignant, grew very rapidly and were simi-

lar to those seen in man, Dr. Bagg reported. He pointed out that spontaneous tumors of the sex organs in birds are very rare.

Yeast Extracts Pinch-Hit

Yeast extracts seem to be able to replace the secretion of the very important internal gland, the pituitary, in stimulating at least partially normal growth in male sex organs, zoologists at the meeting heard from a three-man Harvard University research team: Drs. F. L. Hisaw, R. O. Greep and H. L. Fevold.

The pituitary is sometimes styled the "master gland" because of its apparent control over a large number of bodily activities. Among other things, it must normally provide an essential and continuing stimulus during the growth of the sex organs. If the pituitary is diseased or otherwise put out of action, the individual does not mature.

Yet when Dr. Hisaw and his associates removed the pituitaries from a number of young male rats, and then kept them supplied with an extract made from brewer's yeast, the primary sex glands failed to degenerate and carried on nearly normal growth. Accessory sex structures, however, did undergo regression.

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CHEMISTRY

Cream Separator Technique Used to Separate Isotopes

USING the old principle of the cream separator in whirling materials with great centrifugal force, Prof. J. W. Beams and A. Victor Masket of the University of Virginia reported to the American Association for the Advancement of Science the separation of the isotope of the element chlorine in their high-speed centrifuge apparatus.

A hollow steel rotor containing a small amount of liquid carbon tetrachloride (better known for its cleaning properties) was mounted on a hollow hypodermic needle which served as its axis, and was spun rapidly in a vacuum. Every six and a half minutes a small amount of the fluid was drawn off through the hollow needle and collected in dry-ice traps at a temperature of 70 degrees below zero Fahrenheit. Light, medium and heavy fractions were thus obtained. Each of these was put through the whirling apparatus again. The densities changed gradually until they were roughly in agreement with what they should be if the chlorine in them was one of the several isotopic varieties. The use of this physical method is necessary since it is impossible chemically to separate these chlorine isotopes.

Science News Letter, January 9, 1937

RADIO

Shortest Radio Waves Used at Michigan

THE SHORTEST continuous radio waves ever produced are being used in experiments at the University of Michigan. They are only 6.4 millimeters (about one-quarter inch) in wavelength, report Drs. C. E. Cleeton and N. H. Williams of the department of physics.

So tiny is the tube used to generate the waves that it is assembled under a magnifying glass and its outside dimension is less than one quarter of an inch, state the scientists in their report (*Physical Review*, Dec. 1).

Radio radiation generated by the equipment is being used for studies of the molecular structure of gases, including water vapor. The minute rays have many of the properties of light and travel in straight lines when focused by a concave mirror. Pieces of black paper, hard rubber and wood are transparent to the rays.

The possibility of using them for communication purposes is remote since they are rapidly absorbed by the water vapor in the atmosphere. It is by a study of this absorption, in fact, that scientists are learning new facts about the molecular makeup of water vapor.

The 6.4-millimeters radio waves represent about the limit of radiation which can be produced from vacuum tube sources. To get shorter waves the dimensions of the radio tube must be decreased and ultimately becomes a mechanical impossibility.

For waves shorter than six millimeters it is necessary to use either the radiation from a quartz mercury arc lamp or spark sources in air. The wavelength region from one-tenth millimeter to six millimeter waves is about the last untapped "no man's land" of infra-red research, for only a few isolated measurements have as yet been made in this region.

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ASTRONOMY

Stars in Orion Nebula Double Number Supposed

IN AN obscure corner of the exhibits of the recent Carnegie Institution and not yet officially announced, were three astronomical photographs which revealed that the number of known stars in the great Orion Nebula must now be doubled. They are the work of Prof. W. Baade of Mt. Wilson Observatory and were taken on the great 100-inch telescope using new infra-red sensitive photographic plates.

Orion Nebula, part of the Milky Way, consists of vast clouds of scattered dust particles and gas atoms shining with a blue fluorescent light caused by neighboring high temperature stars. In ordinary photographs taken with blue or green light many of the stars are obscured. Their light cannot come through the dusty regions known as "coal sacks" from their appearance. But just as dust clouds in the earth's atmosphere cut off much blue and green light while continuing to transmit red rays, so do the interstellar dust clouds let through the red light from these hitherto unknown stars.

Prof. Baade, using photographic plates sensitive to the red rays from 8,200 to 9,200 Angstroms, made the pictures which double the number of stars that can be seen. Calculations indicate that the stellar scattering particles are one two-hundred-fifty-thousandth of an inch in diameter.

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IN SCIENCE

MEDICINE

New Knowledge of Cancer Growth Chemistry Reported

CANCER tissue, contrary to generally held opinion, requires the same sort of protein nourishment for its growth that normal tissue does.

Experiments showing this are reported by Drs. Carl Voegtlin, J. M. Johnson and J. W. Thompson, of the U. S. Public Health Service's National Institute of Health.

The results of the studies, in which the growth of cancers in mice were checked by certain types of diet, cannot be applied in the treatment of cancer in man, Dr. Voegtlin emphasized.

New fundamental knowledge of the chemistry of cancer growth, however, has been gained. It is from such knowledge that scientists hope eventually to be able to forge a weapon powerful enough to overcome this dreaded disease.

The growth of breast cancer in mice can be checked, Dr. Voegtlin and associates found, by feeding the animals a diet deficient, though not entirely lacking, in cystine. This chemical is an amino acid, one of the essential building stones of all tissue proteins. Cystine is also part of another chemical, glutathione, which is widely distributed in body tissues and which apparently stimulates the multiplication of normal body cells.

After the cancer growth in the mice had been checked for about a month by the diet deficient in cystine, repeated injection of glutathione caused a marked stimulation of the cancer growth. This shows that glutathione is necessary for the rapid growth of cancer tissue just as it is apparently necessary for growth of normal tissue.

Previous studies by Dr. Voegtlin and associates showed that deficiency of another of the body's protein building stones, lysine, also checked the growth of cancer in mice.

By studies such as these the scientists hope to learn in what ways cancer tissue differs from normal tissue in its chemical requirements for growth.

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NE FIELDS

PSYCHOLOGY

Find Babies Do Not Have Instinctive Fear of Noise

SUDDEN loud noise is not an unfailing cause of fear in young babies. Even the sharp, unexpected crack of a revolver shot failed to produce any signs of fright in many of the 60 babies studied by ultra-slow motion pictures taken at Connecticut College for Women.

Some of the infants did turn away from the direction of the sound, as though they would like to get away from it. But many others looked around toward the noise instead. Older babies tried more often to escape, Prof. William A. Hunt told the American Association for the Advancement of Science in reporting this upset of previous teaching of psychologists.

Some of the babies cried after the noise, but this was not a universal response. There were 33 of them who did not cry, and seven who had been crying before the noise stopped when the gun went off.

Although the loud noise failed to scare all the babies, it did make all of them wiggle their toes, Dr. Francis M. Clarke reported. This movement of the toes when startled by loud noise—sometimes a stretching movement, sometimes flexion—is absent in adults, but is shown by apes. Among the babies, the younger the infant the more violent this reaction.

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ZOOLOGY

A Jonah a Day Represents Whale's Rate of Growth

A JONAH a day would be just about right for a young and rapidly growing finner whale. That is, supposing the finner whale could swallow the prophet—which he couldn't. But anyhow, a whale of this kind, which are the ones most hunted for oil nowadays, increases in size by the equivalent of a big man's weight every day, during his period of most rapid growth.

This is among the host of fascinating whale-facts amassed in many voyages

to both of the earth's frozen ends, by Prof. Johan Hjort, seagoing scientist of the University of Oslo.

Finner whales mate in early autumn, and their young are "calved" in May. The prenatal period is only a little longer than man's. The whale baby feeds on its mother's milk from May until December, when it is weaned. Adolescence lasts from then until about the beginning of the following August. Thus in two years the blue whale passes from infancy to adulthood, although of course it continues to increase in size for a long time after maturity is reached.

The growth naturally goes on at a tremendous rate. In a single day, during the period of most rapid increase in size, the young whale puts on every day the weight of a full-grown man. A really large finner whale will weigh as much as 1,500 men—real he-men, too, the size of the thick-chested Viking whaler captains who pursue them. Cruising at ten knots, Prof. Hjort has calculated, they must put forth an effort equivalent to 47 horsepower. The Norse biologist added that he has been on ships pursuing such whales at a speed of fourteen knots—and not catching them.

The oily blubber, chief prize in whaling, performs a very important biological function for the whales. It is to these huge sea mammals what the hump is to a camel—a reservoir of energy-food stored up in time of abundance, to be drawn upon in seasons of scarcity. Because of the tremendous quantitative fluctuations in the various forms of sea life on which whales feed, they must often go for long periods without feeding, and often cruise for hundreds of miles without so much as a herring or a shrimp to eat.

A second function of the blubber is protection from the cold. Fat is an excellent non-conductor of heat, so that a whale well wrapped up in his subcutaneous layer of blubber can live for weeks and months in polar water at a temperature near or below freezing.

Whalebone, formerly next in importance only to oil in the whaling industry, is now an object of practically no value, thanks to the radical change in ladies' fashions since the wasp-waisted Late Victorian days. Nowadays the whalebone sieve from the animal's jaws is simply dropped into the sea.

In years of studies of whales, Prof. Hjort has gone on many long voyages into the remotest waters of the world, on all kinds of craft, from the little "catcher" boats scarcely larger than tugs, to the newest "floating factories"

of 30,000 tons, which (except for the inescapable whaleoil odor) afforded him all the luxuries of a first-class suite on a modern super-liner.

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BIOPHYSICS

Find Virus Molecules Like Heredity-Carrying Genes

NEW evidence for striking likeness in physical and chemical makeup between viruses, the submicroscopic "living molecules" that transmit diseases, and genes, the invisible somethings that abide in or on the chromosomes of cells and transmit hereditary qualities in humans, animals, and plants, was produced for the consideration of biologists at the meeting of the American Association for the Advancement of Science, by Drs. J. G. Gowen and W. C. Price of the Rockefeller Institute for Medical Research, Princeton, N. J.

Drs. Gowen and Price traced this vital similarity between viruses and genes through ultraviolet and X-ray experiments on the particular virus that causes the mosaic disease of tobacco leaves. First, they took juice pressed out of diseased leaves, known to contain the virus, and rayed that, keeping track of the rate at which the virus was killed off. But they knew that the juice contained plenty of non-virus protein molecules, that absorb the rays; it was as though they were firing at targets that were scattered among sandbags.

So they purified the virus, getting it in crystalline form, and bombarded that with rays. The rate of destruction was greatly increased. Then they mixed more of the purified crystalline virus in juice pressed from undiseased leaves, and rayed the mixture. The rate of destruction of the virus became almost identical with that in the original juice from diseased leaves.

Raying the virus with non-lethal doses of either ultraviolet or X-rays produces "mutations," just as raying the germ-cells of animals and plants brings forth these sudden evolutionary shifts. These mutations in the virus show themselves in the changed character of the injury they do to leaves when they are injected into the plants.

In general, viruses and genes are "hit" by various kinds of rays in a rather similar fashion, and respond in ways that are suggestively alike. The inference therefore seems legitimate that in size at least, and quite possibly in other ways as well, they really are alike.

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CHEMISTRY

Find Cancer-Causing Chemical By Rebuilding Molecules

A NEW cancer-causing chemical, discovered by experiments with chemical architecture, was reported by Prof. Louis F. Fieser of Harvard University to the American Association for the Advancement of Science.

Associated with Prof. Fieser in this research were his wife, Mary Fieser, and E. B. Hershberg, A. M. Seligman and, formerly, M. S. Newman. Animal studies with this and other compounds were conducted by Dr. M. J. Shear of the U. S. Public Health Service.

Discovery of the new compound simplifies the problem of cancer research of this type and makes it easier to determine the mechanism of cancer production by chemicals of the hydrocarbon group, Prof. Fieser explained.

The new compound was discovered

in the course of attempts to find what features in the structure of another chemical compound, methylcholanthrene, made the latter the most powerful cancer-causing hydrocarbon known. The new compound is also a hydrocarbon, which means it is made up exclusively of hydrogen and carbon. But the new compound, while sharing the remarkable cancer-causing power of methylcholanthrene, is far simpler in its chemical architecture.

Results of this research detract somewhat from the theory that some forms of cancer result from the formation of methylcholanthrene in the body, Prof. Fieser pointed out. He added, however, that his research group is not yet prepared to say that this theory is excluded.

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son, would be simulated by an idealized cylinder 35 kilometers (21.7 miles) in length and 11 kilometers (6.8 miles) in diameter. Its mass is 10,000,000,000,000,000,000 grams, or about 100,000,000,000,000 tons. Thus it has only about 1/10,000,000 the mass of the earth. Its light is slightly redder than sunlight.

The observing period of 1937-38 will be a favorable one, stated Mr. Watson, and it is hoped that more accurate observations will clear up additional mysteries about the tiny object.

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PSYCHOLOGY

Study Attitudes Toward Communism and Fascism

THE effect in America of the war-crises of European nations against "communism" will be assayed scientifically in science's latest drive to put psychology to work.

A person-to-person survey is planned by Dr. Delos D. Wickens, University of North Carolina psychologist, to determine changes in attitude toward two social and economic ideologies—fascism and communism.

The inquiry is part of a nation-wide program under which scientists of the United States are banding together for a united front against problems now confronting society in the present world crisis.

Involvement of the United States in a future world war may depend upon how the attitudes of individual Americans are now changing toward these two isms, Dr. I. Krechewsky, of the University of Chicago, emphasized, in making announcement of the new research program. Dr. Wickens' survey is authorized by the newly organized Society for the Psychological Study of Social Issues. Dr. Krechewsky is secretary of this organization and spokesman for its scientist-members.

Nations in Europe now seem to be lining up according to their attitudes toward the fascist-dictator type of government of which Germany with its Hitler and Italy with its Mussolini are outstanding examples, or toward the communist type, of which Russia is the recognized symbol. The possibility of a war in which fascist nations will lead a crusade against communism is obvious, Dr. Krechewsky indicated.

Groups selected as representative samples of the general public opinion of the nation will be tested at intervals under Dr. Wickens' direction to find out

ASTRONOMY

Three More Chemical Elements Identified in the Sun

THREE new chemical elements—osmium, iridium and thulium—have been added to the positively identified elements found in the sun during 1936, declared Dr. Charlotte E. Moore of Princeton Observatory before the meeting of the American Astronomical Society.

Out of the 92 chemical elements of the earth, 61 are surely present in the sun; three are doubtfully present; on two there are insufficient solar data, on seven insufficient laboratory data, and 19 are absent.

Method of identifying the solar elements, explained Dr. Moore, is to obtain spectrographic plates from the sun's light and then try to duplicate those characteristic spectral lines by experiments in the laboratories.

During the last year, she said, Dr. Walter Albertson of Massachusetts Institute of Technology thus identified osmium and iridium. Dr. W. F. Meggers, noted scientist of the National Bureau of Standards in Washington, obtained the spectrum of the rare earth thulium in his laboratory and thus aided in its solar identification.

Strangely absent, so far, are identifications of the gas neon and the rare-earth caesium in the solar spectrum. Both have long been identified in the laboratory.

Physical Nature of Eros

The physical nature of the earth's neighbor in space—the tiny asteroid Eros whose diameter is probably only about 15 miles—was described by Fletcher Watson of Harvard Observatory.

Travelling in a very much flattened elliptical path, Eros can come as near as 13,840,000 miles to the earth on some occasions. Thus, although it is very small, it has been most accurately observed since its discovery in 1898.

Back in 1901 the brightness of Eros was reported to show a change of one and a half magnitudes in the short time of five and one quarter hours, explained Mr. Watson. At other times its variation has sometimes been small, sometimes large and sometimes zero. Its perplexing changes have intrigued astronomers.

The motion of Eros, said Mr. Wat-

whether the attitudes of Americans are shifting in either direction and what that direction is.

Another attack on the problem of individual attitudes on political and economic questions is being launched at the University of Akron under the direction of Dr. Ross Stagner. He is attempting to find out whether men and women tend to break away from the political affiliations and prejudices of their parents as they grow older and acquire more education. Beginning with college students and their parents, but extending soon to high school pupils, this program

calls for a comparison of the attitudes and opinions of fathers, mothers, sons and daughters.

Dr. R. A. Irwin of the University of Nevada is attacking another objective. He will rate the attitudes of persons toward various social and economic institutions from one extreme of strong approval to the other of strong disapproval. This rating will then be compared with the individual's information on current politics, with the amount of his reading in various fields, and with his general interests.

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CHEMISTRY

Invisible Films on Water Give New Research Tools

By DR. IRVING LANGMUIR

Dr. Langmuir, Nobelist in chemistry, of the General Electric Research Laboratories, explains his latest researches on thin films that promise to allow scientists to learn more about the cell and detect extraordinarily small amounts of chemical impurities. He exhibited at the Atlantic City meeting of the American Association for the Advancement of Science.

MANY oils placed in minute amounts on water spread out over the surface to form layers one molecule thick. A convenient substance to illustrate this phenomenon is stearic acid, which is the acid constituent of beef fat.

Films of this substance are one ten-millionth of an inch thick and are completely invisible. Nevertheless by an ingenious technique they may be transferred in successive layers to a glass or metal plate which is repeatedly dipped into water covered by such a film.

When 35 or more layers are built up in this way on a chromium-plated slide beautiful iridescent colors are produced like those of soap bubbles. A study of the colors makes it possible to measure accurately the thickness of the film.

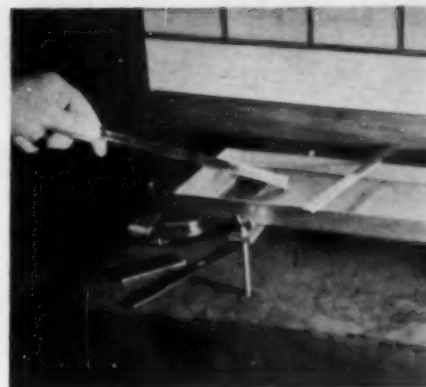
The exhibit showed numerous glass and metal slides covered with films of stearic acid and proteins which have been treated in various ways to demonstrate their remarkable properties. By using polarized light it is shown that a single layer of stearic acid molecules on chromium can be distinctly seen by the change in the intensity of the reflected light.

If a single layer of protein egg albumin, for example, is placed on part of a film of 41 layers of stearic acid, the change in color is very striking, so that in this way the dimensions of protein molecules can be measured.

Other slides illustrate skeleton films. By spreading stearic acid films on water containing barium salts the built-up films consist of a mixture of barium stearate and free stearic acid. By dipping a part of the slide covered by such a mixed film into benzene, the stearic acid can be dissolved out. This completely changes the color of the film. The thickness of the film is not changed. The stearic acid molecules when removed leave pores or holes so that the film becomes a barium stearate skeleton. When an oil drop is placed on such a skeleton the oil fills the pores and the film returns to its original color.

By covering a mixed film with a blanket consisting of a number of layers of protein or of pure barium stearate, the rate at which the underlying stearic acid is removed by benzene and the rate at which oil can be made to return into the pores are greatly decreased. In this way the permeability of molecular layers for many different substances can be measured.

This method should be of great help to the biologist in understanding the permeability of cell walls. It also provides a means of measuring the sizes of many molecules since the skeleton film is a kind of molecular sieve. The monomolecular films on water and the multimolecular layers formed from them are tremendously sensitive to minute traces of various substances in the water.



FOR THIN FILMS

Dr. Irving Langmuir's apparatus for securing thin layers of oil on water for study through colors. This was a part of his demonstration at the meeting of the American Association for the Advancement of Science.

A study of these films thus provides the chemist with an extraordinarily sensitive method of detecting and even measuring the amount of many chemical substances.

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PSYCHOLOGY-PHYSIOLOGY

Closed Circuit in Brain Between Cortex-Thalamus

A CLOSED circuit between two parts of the brain was described by Prof. J. G. Dusser de Barenne of Yale University to the American Association for the Advancement of Science.

The idea that these two parts of the brain, the cerebral cortex, commonly thought of as the thinking part of the brain, and the optic thalamus, through which all impulses from the outside of the body pass, are in close mutual functional relation was suggested many years ago.

At the meeting, Prof. Dusser de Barenne presented the first experimental proof of the validity of the theory. His experiments showed that the cortex, after receiving impulses from the thalamic nerve cells, sends impulses back to the thalamus. The thalamus and cortex, therefore, form a closed circuit in which impulses circulate all the time.

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A Chinese engineer has invented a teletype machine to transmit China's thousands of character words by wire, thus avoiding the need to send each word in Chinese messages by a code number.

GENERAL SCIENCE

American Institute Awards To Bell Laboratories, Davis

THE AWARD of the Gold Medal of the American Institute of the City of New York for 1937 to the Bell Telephone Laboratories and of a fellowship to Watson Davis, director of Science Service, was announced by Gerald Wendt, director of the Institute. The awards will be made at a meeting of the Institute to be held February 4.

The gold medal, given annually by the American Institute in recognition of accomplishment in research, was awarded to the Bell Telephone Laboratories "for researches in electrical science which, as applied to communication, have promoted understanding, security and commerce among peoples by transmitting human thought instantly throughout the world," the announcement stated.

The fellowship in the Institute, conferred in recognition of outstanding success in the interpretation of science to laymen, was awarded to Mr. Davis "for interpreting to the people of the Nation the rapid progress of science upon which modern civilization depends and for the organized dissemination of research findings as news," the announcement continued.

One of the pioneer industrial organizations for scientific research, the Bell Telephone Laboratories, Dr. Wendt said, developed and perfected many of the valuable means of modern communication, the field in which it has pioneered. Trans-oceanic and ship-to-shore wireless telephone service, which enables persons to converse with privacy; long distance wire telephony spanning continents using vacuum tube amplifiers; high fidelity, high power voice and sound transmission and recording applied to sound records, talking motion pictures and public address systems; and commercial transmission of pictures by wire: these are among the many results of the work of men in this great research organization. The award will be received in the name of the more than 4,000 men and women of the Bell Telephone Laboratories by Dr. F. B. Jewett, its president.

Watson Davis, who will receive a fellowship in the Institute, is editor of the SCIENCE NEWS LETTER and author and editor of books and articles on scientific subjects. He is author of "The

Story of Copper" and editor of "Science Today" and "The Advance of Science."

The American Institute of the City of New York was incorporated in 1828 for the purpose of encouraging and promoting domestic industry in this State and in the United States. Each year important new inventions made their first bows to the public under the Institute's sponsorship. The Remington typewriter, the Morse telegraph, the Bell telephone, are only a few of them.

Through the years the Institute has fostered agriculture, engineering and science. Many present-day scientific societies in these fields were originally sections of the American Institute.

The American Institute is still the patron of industry. Through its weekly round table gatherings and monthly general meetings, pioneers in research still bring to the attention of the public the results of those efforts which continue to change our mode of living.

Among high school students—our embryo Einsteins and Edisons—the Institute carries on a program of science studies. These culminate in the Children's Science Fair, where liberal awards for prize-winning exhibits enable students to buy needed equipment for slimly-furnished laboratories.

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MEDICINE

Gland Promises Weapon Against Severe Infections

A GLAND mystery has been solved and doctors may soon have a new weapon to use on severe infections.

Dr. Raymond L. Zwemer, College of Physicians and Surgeons, Columbia University, explained to the New York Academy of Sciences the mystery concerning the fighting glands of the body, the adrenals, which are perched like two cocked hats one on top of each kidney.

These glands produce the familiar adrenalin, and the less familiar but life-essential cortin. Dr. Zwemer and his associate, Dr. Richard Truszkowski, have apparently found why cortin, produced by the cortex of the adrenal

glands, is so essential to sustain life.

Without cortin, the body would die of potassium poisoning, it appears from their experiments. The cortex of the adrenals regulates potassium in the body, somewhat as the islands of Langerhans in the pancreas regulate sugar.

Potassium, a metallic element familiar to first-year chemistry students, may be considered as the unknown poison, Dr. Zwemer said, "that we always have with us." This element belongs in the cells of the body but not in the body fluids. It is apparently the job of the adrenal gland cortex to keep potassium in the cells and out of the fluids. When the gland cortex, due to disease or injury, breaks down, potassium gets into the fluids, especially the blood, and death follows, apparently from potassium poisoning.

Drs. Zwemer and Truszkowski developed a method for detecting potassium in small quantities of blood. With this test, they found that the amount of potassium in the blood becomes increasingly high in animals suffering from lack of adrenal gland cortex. Giving cortin, or adrenal cortical extract, to these animals caused a decrease in the blood potassium. Final proof of the connection between the adrenal glands and potassium was obtained by giving potassium to normal animals. This caused symptoms of adrenal cortex insufficiency, including loss of appetite, weakness, disturbance of blood circulation and finally death.

Addison's disease, fatal malady due to injury or disease of the adrenal gland cortex, can be fought by giving the gland extract, cortin. Patients are saved from death and can be kept alive by this extract, much as diabetic patients are kept alive by insulin. But the treatment must be continued, and the supply of cortin is limited. Since these patients are actually suffering from potassium poisoning, they might be kept alive and healthy without cortin by a diet lacking in potassium.

Possibility that cortin, on the other hand, may be a valuable remedy in other conditions than Addison's disease was suggested by Dr. Zwemer. Bacterial infections which injure the cells, or cell injury due to accidents—burns or automobile accidents—may give potassium a chance to escape from the cells and get into the body fluids, where it is dangerous to life. Doses of cortin, to supplement that made by the body's glands, might be a life-saving treatment in such conditions.

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POPULATION

Mankind Likened to Lemmings In Blind March to Destruction

Spurt of Human Population Growth in Past 300 Years Like Rapid Multiplication of Lower Mammals

MANKIND joining in a great mass movement toward self-destruction, driven blindly into a war by stern biological forces that it does not understand. That was the mental picture presented to the scientific audience at the meeting of the American Association for the Advancement of Science by Dr. Raymond Pearl, biologist of the Johns Hopkins University.

Studying such lowly creatures as the fruit fly, beetle and even the yeast cell, hundreds of generations of which can be observed during the working lifetime of a single scientist, Dr. Pearl has drawn lessons that apply to higher forms of life, including man himself. The lemming, a lower mammal, demonstrates how blind biological forces drive creatures to multiply until great population pressures are built up and then drive them on to mass suicide. This Arctic animal has great spurts of reproductivity and after the population density has reached a certain limit, starts mass migratory movements. These great marches blindly push on until some obstacle like the sea or a river is reached. There vast hordes of the migrants still push on to their death.

A parallel is found in the rapid spurt of human population growth, Dr. Pearl pointed out. In a minimum of 100,000 years up to the year 1630, man's numbers grew only to 445,000,000. Yet in the 300 years since then, the population has grown to some 2,073,000,000.

"For thousands upon thousands of years the human population of the earth grew slowly, because the conditions necessary to more rapid growth did not exist," Dr. Pearl said. "Then about 300 years ago, the advancement of learning suddenly expanded man's effective universe and has kept on expanding it. There has followed a spurt of population growth of an explosiveness that is seen, when plotted to a proper time scale, to be comparable to that of an epidemic.

"This has produced a density of 40 persons per square mile for every single square mile of the land area of the earth—good, bad, and indifferent land all

counted in. That there are associated with this present density stimuli producing sensations of discomfort seem scarcely open to argument. Can it be honestly denied that, on a world-wide view, unrest is the dominant characteristic of human behavior today? And behavioristically viewed, unrest is surely the cardinal symptom of discomfort.

"Up to this point the parallelism between the two cases seems reasonably evident. Not being a prophet I have no desire to push it further. But I do venture to suggest that it merits thought. Different species react in different ways to similar stimuli, especially in the emotional field.

"One scarcely envisages mankind marching to a watery grave just behind a horde of frantic lemmings. But does anyone find it difficult to conceive of man marching off in the not too distant future to a war? Or to doubt that once well started that war will entangle in its meshes the major portion before it is finished?"

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ANTHROPOLOGY

Bones of Ancient Indians Point to Tuberculosis

BONES of three long-dead Indians held the spotlight at the meeting of the American Anthropological Association as the controversy as to whether the tuberculosis germ plagued prehistoric Americans was reopened.

Dr. William A. Ritchie of the Rochester Museum of Arts and Sciences reported finding the three cases which point to presence of tuberculosis in America before white men arrived.

Many scientists have doubted that tuberculosis was an early American disease, Dr. Ritchie said, because the Indian tribes proved so highly susceptible to the germ when they encountered it among European explorers and colonists.

The prehistoric Indians now tentatively diagnosed as tuberculosis cases bear signs of the disease in bones of the hip, spine, or sinus tracts. All three were unearthed in New York State, and

were among the 411 prehistoric Indian skeletons of that state which the archaeologist has studied to add to knowledge of diseases of the Indians.

Arthritis, chiefly in the leg joints and spine, was the commonest bone ailment that attacked these Indian groups, he has found.

Modern Life Not So Bad

Don't blame modern civilization too much for aches and diseases. Bones unearthed in a city of 3000 to 1500 B. C. reveal that life was harder then on the human frame than it is today.

Pointing out this moral from his study of what an entire population was like at Tepe Hissar, Persia, Dr. W. M. Krogman of Western Reserve University said that arthritis plagued more than one adult in four in the ancient city. From the skeletal material, the people appear to have suffered from tuberculosis, varicose ulcers, poor nutrition, impacted wisdom teeth, broken bones, and other troubles. He also found two surprising instances of what may be syphilis, already plaguing mankind in so early an era.

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BIOLOGY

Blue Stain in Cotton Traced to Cause in Fungus

BLUE stain in cotton, which sometimes causes serious loss in market value of the staple, has been traced to its cause by O. P. Owens of North Carolina State College. The guilty organism is a fungus, belonging to a large tribe of vegetable criminals that bears the generic name *Alternaria*. Pure cultures of the fungus planted on sterile mature cotton fibers repeatedly produced the damaging blue color.

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Streamlined trains were predicted in 1813.

Nature Camp

Study Nature in the picturesque mountains of Central Pennsylvania. Plant and animal life at first hand, studied under a competent faculty.

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BACTERIOLOGY-MEDICINE

Whooping Cough's Whoop Captured in a Test Tube

Laboratory Cultivation of Spotted Fever Germ Also Reported to Society of American Bacteriologists

THE WHOOP of whooping cough has been captured, so to speak, in a test tube in the laboratory. At least, the discharge or exudate that makes the whooping cough patient whoop has been produced outside the body and has all the sticky qualities of the material coughed out by the patients.

Production in vitro of this sticky exudate was reported by Dr. John A. Toomey of Western Reserve University and Cleveland City Hospital at the meeting of the Society of American Bacteriologists. Dr. Toomey suggested that this material might be used to protect persons against the worst stages of the disease, and that some way might be found to prevent the whoop altogether by vaccinating against this exudate itself.

It is not the whooping cough germ but something the germ produces that causes the cough and whoop, Dr. Toomey explained. The germ of the first phase of the disease, which goes by the scientific name of *Hemophilus pertussis*, produces nothing more serious in a human being than rhinitis, a nose inflammation resembling a cold in the head.

As the disease progresses the patient gradually becomes sensitized to the germs and the poisons in their bodies.

The patient then begins to whoop and the most severe stage of the disease follows. As the patient's condition gets worse, the germs of the first phase of the disease are less easily found.

In view of his finding that the exudate or discharge is the agent that produces the most severe stage of the disease, Dr. Toomey pointed out that it would be logical to try to protect persons against this substance. Injecting the cough-producing factor itself in patients already ill with the disease might make them immune to it more quickly and hasten their recovery.

Spotted Fever Germ Grown

A further step toward conquest of dangerous Rocky Mountain spotted fever appears in the report of Ida A. Bengtson, bacteriologist of the U. S. Public Health Service's National Institute of Health. Miss Bengtson has succeeded in growing the germs of this disease on artificial culture media in the laboratory. With further improvement in the method it is hoped that the laboratory-grown germs can be cultivated in sufficient numbers to be used in making the vaccine that protects against the highly fatal spotted fever.

At present the vaccine must be made by grinding up live ticks that harbor

the spotted fever germs in their bodies. The procedure is dangerous for those engaged in vaccine production, and the resulting vaccine is costly and the supply limited. The fact that Rocky Mountain spotted fever is not confined to the Rocky Mountain region but has been found in many eastern states as well makes it a public health problem of national concern.

Tick Carries Horse Disease

The virus germ that causes encephalomyelitis in horses is carried by a tick, Drs. Jerome T. Syverton and George Packer Berry of the University of Rochester School of Dentistry and Surgery reported. This is the first time, it seems, that a tick of the genus *Dermacentor* has been implicated as carrier of a filterable virus disease.

The Rochester investigators had previously found that gophers can get the disease as well as horses. The fact that gophers, the disease itself and ticks of this genus are all found at the same seasons in the same geographical locations seemed significant and led to the investigations of the tick as carrier of the virus. This proved to be the case. The virus is carried by the ticks in all stages of their developmental cycle, including the egg stage.

Pasteurized Sweet Wine

Pasteurized wine may be on the market some day, it appears from studies reported by Drs. H. C. Douglas and L. S. McClung of the University of California. Pasteurization, they found, will overcome bacterial spoilage of fortified sweet wines which has been a serious problem in the California wine industry.

The bacteria causing the spoilage were described by the scientists. Sulfur dioxide as well as pasteurization will overcome the difficulty.

Wines most frequently affected were muscatel, sherry and angelica. Occasionally the spoilage was found in port, Tokay and Malaga wines.

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NEW JOBS FOR MOLDS—H. T. Her-
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Jan. 19, 5:15 p.m., E.S.T.

SWIMMING IN WINTER—Ralph E.
Tarbett of the U. S. Public Health
Service.

In the Science Service series of radio dis-
cussions led by Watson Davis, Director,
over the Columbia Broadcasting System.



What is an Evergreen?

VERY many people, possibly most of us, commonly use the word "evergreen" to mean all trees of the group that includes pines, spruces, firs, and junipers. True, almost all the trees in this group really are evergreens, for their green leaves stay on them all year round. Yet the European larch and its American cousin the tamarack shed their leaves in the fall and stand as naked through the winter as any maple or birch.

One effort to get round the difficulty is to ignore the question of leaf-loss and evergreenness, and group all the trees of this particular botanical kinship as conifers. That is more scientific, for the fruits of most of them are cones. But to put all other trees into the general class of "broad-leaved trees" again gets you into difficulties. For some of the fairly close relatives of pines and spruces have broad leaves—notably the Asiatic ornamental tree, the ginkgo, now coming into increased use in this country. Furthermore, the ginkgo's fruit is not a cone but looks rather like a skimpy-fleshed plum.

Another difficulty arises when we encounter the many broad-leaved trees that are also evergreens, like the live-oaks of the South and Southwest, and very conspicuously the glossy-leaved magnolias, bays, and hollies, and such shrubs as mountain laurel and rhododendron. There are many lowlier plants, too, that are both broad-leaved and evergreen, particularly in the heath family. There are even many non-woody plants that are true evergreens, because their leaves survive the winter: Christmas fern, hepatica, yucca, are good random examples.

It boils down to this: an evergreen is any kind of a plant that stays green

through the winter. It is a physiological or ecological term, and has nothing to do with the plant's botanical classification.

The distinction between the pine-spruce-juniper-ginkgo group and the other members of the plant kingdom can be accurately made only on a strictly

botanical basis. Botanists call the one group Gymnosperms, the other Angiosperms. But it is perhaps too much to demand that these formidable-looking words be adopted into common use—at least, until we have all learned a little systematic botany.

Science News Letter, January 9, 1937

MEDICINE

Fatal Blood Clot Prevention Promised by Heparin

FATAL blood clots in the veins or arteries, the tragic consequence in many an operation and blood transfusion, may be prevented in future by the use of heparin, it appears from a report of a University of Toronto research team to the Canadian Medical Association. (*Journal*, December.)

Members of the research team are Drs. D. W. G. Murray, L. B. Jacques, T. S. Perrett and C. H. Best, the latter a co-discoverer of insulin.

Heparin, these scientists found, acts in two ways: 1. By making the blood clot more slowly, which would make it a valuable aid in blood transfusions where there is always danger of clotting; 2. By preventing dangerous narrowing or closing of the veins following injury to them.

Heparin was first prepared from the livers of dogs by Dr. William H. Howell, professor emeritus of Johns Hopkins University. As little as one milligram, about one hundredth of a grain by weight, will prevent clotting of about an ounce of blood for an hour, Dr. Howell found in his original investigations.

Use of this potential life-saving remedy was limited because of lack of sufficient supply of the material in highly pure form. This has been overcome by Drs. Arthur Charles and D. A. Scott of the Connaught Laboratories.

Their highly purified heparin has been used safely and successfully in both human patients and dogs, Dr. Best and associates report.

This heparin slowed the clotting of blood from a normal of 8 minutes to a maximum period of 30 minutes.

Heparin's effect on the veins may be equally important. The veins may be thought of as hollow tubes through which the blood flows. If injury or disease makes the walls of these tubes

thicker, there may not be enough room for the blood to get through, and the veins are said to be occluded. It is thought that this may be a factor leading to formation of blood clots, which would completely block the circulation. The danger from such clots depends on the importance of the vein in which they form.

Heparin reduces the chance of such clots by its effect on the blood and in addition prevents the closing of a vein following injury. If injections of heparin are continued long enough in such cases, the Toronto scientists found, the injured vein heals and there is greatly reduced tendency for it to close up after heparin treatment is stopped.

Injecting heparin into a vein affects the blood throughout the entire body, making it clot less readily. Injecting it into an artery, on the other hand, produces a more local effect. This arterial injection affects the blood flowing through the particular arm or leg where the heparin was injected.

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Anthropology

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Science News Letter, January 9, 1937

Travel

THE FLIGHT OF "BIG HORSE"—Sven Hedin—*Dutton*, 248 p., illus., \$3.75. To his well known books on Asiatic exploration, Dr. Hedin adds this remarkable and exciting account of how he became entangled in fierce Chinese civil war, in 1934. "Big Horse" named in the title was the young general leading revolt against a despot ruler.

Science News Letter, January 9, 1937

Science-Teaching

NATURE MAGAZINE'S GUIDE TO SCIENCE TEACHING—E. Laurence Palmer—*American Nature Association*, 128 p., \$1. A compact guide for general science teachers in elementary and junior high schools.

Science News Letter, January 9, 1937

Entomology

SPIDERS AND THEIR KIN—E. Laurence Palmer—*N. Y. State College of Agriculture*, 32 p., 10c. if obtained direct from Cornell Rural School Leaflet, N. Y. State College of Agr., Cornell University, Ithaca, N. Y. An especially valuable feature is the tabulated arrangement of essential information about the principal great groups of arachnids.

Science News Letter, January 9, 1937

Mental Hygiene

HOW TO WORRY SUCCESSFULLY—David Seabury—*Little, Brown*, 358 p., \$2.50. By a lecturer and popular writer on psychological subjects.

Science News Letter, January 9, 1937

Radio

THE RADIO AMATEUR'S HANDBOOK (14th ed.)—*American Radio Relay League*, 536 p., paper \$1, buckram \$2.50. The 1937 "Bible" for amateur radio operators contains extensive revisions necessitated by the sweeping changes in amateur radio practice. Most of the chapters have been entirely re-

written and all of them have been thoroughly modernized. Two hundred new illustrations are included. Of interest will be the new section on developments in noise silencers for short-wave receivers, a new technical trend in circuit design.

Science News Letter, January 9, 1937

Mineralogy

DIRECTORY OF AMERICAN MINERAL AND GEM COLLECTORS AND COLLECTIONS—William C. McKinley, Comp.—*Pub. by Wm. C. McKinley*, 730-B-4th St., Peoria, Ill., 26 p., 10c. if obtained direct from publisher.

Science News Letter, January 9, 1937

Ethnology

A 17TH CENTURY LETTER OF GABRIEL DIAZ VARA CALDERÓN, BISHOP OF CUBA, DESCRIBING THE INDIANS AND INDIAN MISSIONS OF FLORIDA—Transcribed and translated by Lucy L. Wenhold—*Smithsonian Inst.*, 14 p., 12 plates, 20c.

Science News Letter, January 9, 1937

Research

DOCTORAL DISSERTATIONS ACCEPTED BY AMERICAN UNIVERSITIES, 1935-1936—Donald B. Gilchrist, Ed.—*Wilson*, 102 p., \$2. Compiled for the National Research Council and the American Council of Learned Societies by the Association of Research Libraries.

Science News Letter, January 9, 1937

Chemistry

TRANSACTIONS OF THE INSTITUTION OF CHEMICAL ENGINEERS, VOL. 13, 1935—*Institution of Chemical Engineers*, London, 235 p., illus. Now available is the reprint summary of this meeting held in London, February 22, 1935. Explosives manufacture, glass, distilleries, spray drying, and welding are among the topics discussed.

Science News Letter, January 9, 1937

Botany

CHECK-LIST OF PLANTS OF GRAND CANYON NATIONAL PARK (Rev. ed.)—*Grand Canyon Natural History Assn.*, *Grand Canyon National Park, Ariz.*, 75 p., 50c. Obtainable by purchase directly from publishers.

Science News Letter, January 9, 1937

Nature Stories

ANIMAL LIFE IN THE WILDERNESS—Howard L. Hastings—*Cupples & Leon*, 314 p., illus., \$2. Two boys are taken on all sorts of thrilling adventure-trips into all the world's big-game lands, from the Canadian Arctic to the South African bush. Most of the shooting is done with cameras, there are some "bring-'em-back-alive" stories, with just a few cartridges fired in emergencies. There are a lot of lively black-and-white illustrations, and four colored plates.

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Botany

PLANT PROPAGATION FOR THE GARDEN—David C. Fairburn—*Double-day, Doran*, 115 p., \$1. A compact but comprehensive little book that will help any gardener, amateur or professional, to "have good luck" with his cuttings, transplants, and sensitive seedlings. Clear line illustrations help to show how.

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Physiology—Piano Technique

THE RIDDLE OF THE PIANIST'S FINGER, AND ITS RELATIONSHIP TO A TOUCH-SCHEME—Arnold Schultz—*Univ. of Chicago Press*, 317 p., \$3.50. A technical work of interest principally to pianists and teachers of piano.

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Dietetics

APPLIED DIETETICS, THE PLANNING AND TEACHING OF NORMAL AND THERAPEUTIC DIETS—Frances Stern—*Williams & Wilkins*, 263 p., \$3.50. Designed primarily for nurses, dietitians and home economics workers, this book might also prove useful to others who must plan special diets.

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Pharmacy

EPITOME OF THE PHARMACOPEIA OF THE UNITED STATES AND THE NATIONAL FORMULARY WITH COMMENTS—Robert A. Hatcher—*American Medical Assn.*, 240 p., 60c. A useful handbook for busy physicians; of no interest to lay readers.

Science News Letter, January 9, 1937

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